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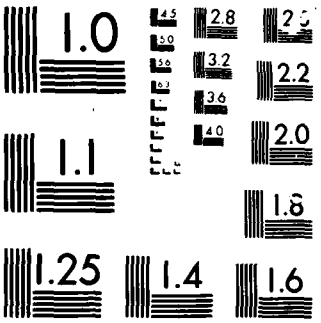
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MOSQUITO INFORMATION MANAGEMENT PROJECT (MIMP): APPLICATION OF A COMPUTERIZED GENERAL PURPOSE INFORMATION MANAGEMENT SYSTEM (SELGEM) TO MEDICALLY IMPORTANT ARTHROPODS (DIPTERA: CULICIDAE)

Annual Report

Terry L. Erwin

August 1983

supported by

U.S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND
Fort Detrick, Frederick, MD 21701

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Smithsonian Institution
Washington, DC 20560

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The Mosquito Information Management Project (MIMP) is a collaborative venture between the Walter Reed Biosystematics Unit (WRBU), Walter Reed Army Institute of Research (WRAIR), and the Department of Entomology, National Museum of Natural History, Smithsonian Institution. The Project was established in September 1979, to develop a computer-based systematic and ecological computer file (data bank) for the approximately one million mosquito specimens in the National Museum of Natural History collection. This collection is the largest and most complete

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

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During this report period data from an additional 4,543 collection forms, representing roughly 116,698 specimens, were entered into the computer.

Development continued for the seven separate geographic files, incorporating data for Mexico, Central America, South America, the Caribbean Region and Eastern Africa. The file for Mexico and Central America was recently made current with the entry of collection data for the final country Mexico. Emphasis has now been switched from Central America to entering collection information into the data base for South American countries. These files allow for rapid and inexpensive search capability that will be a major advantage as the data base expands.

MIMP expanded its communications capabilities with the WRBU NBI Word Processor. The word processor was tailored for communication with the DEK Word Processor in the Smithsonian's ADP (Automatic Data Processing) Office, and the NBI Word Processor at the Department of Arbovirology, USAMRIID, Ft. Detrick, Maryland.

MIMP expanded its map-making capabilities with the incorporation of the computer program World Data Bank II and the use of the state-of-the-art Calcomp Plotter, in cooperation with the Office of Information Resource Management (OIRM). In addition, the size of the world map collection was increased to over 11,300 maps.

ANNUAL REPORT
MOSQUITO INFORMATION MANAGEMENT PROJECT

SUMMARY

The Mosquito Information Management Project (MIMP) is a collaborative venture between the Walter Reed Biosystematic Unit (WRBU), Walter Reed Army Institute of Research (WRAIR), and the Department of Entomology, National Museum of Natural History, Smithsonian Institution. The project was established in September 1979, to develop a computer-based systematic and ecological computer file (data bank) for the approximately one million mosquito specimens in the National Museum of Natural History collection. This collection is the largest and most complete mosquito collection in the world and represents a national treasure. The data management system, SELGEM (SELf-GEnerating Master), was selected as the primary data storage/management system. Data recorded on collection forms are submitted to a Honeywell® Series 60 Level 66/80 computer system via a Nixdorf® 600/55 minicomputer data entry system.

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FOREWORD

Citation of trade names in this report does not constitute an official endorsement or approval of the use of such commercial items.

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INTRODUCTION

The National Museum of Natural History, Smithsonian Institution, houses a mosquito collection of over one million specimens from all over the world. This collection is the largest of its kind and is well curated. During the last 19 years the collection has grown 5-fold, primarily due to several U. S. Army Medical Research and Development Command contracts, i.e., the Southeast Asia Mosquito Project (SEAMP), the Mosquitoes of Middle America Project (MMAP) and the Medical Entomology Project (MEP). World areas that are particularly well represented in the collection are the Nearctic, Neotropical, Oriental and South Pacific faunal regions. These specimens, combined with their associated collection data/records, represent a major scientific resource for Medical Entomologists, Epidemiologists and Public Health Workers. Unfortunately, the collection has received very little attention to date (except by taxonomists).

The Mosquito Information Management Project (MIMP) was established in 1979 to develop this outstanding source of data on known and potential vectors of human pathogens into a computer-based systematic and ecological data bank. This data bank is based on data from specimens identified by taxonomic authorities and (1) provides important, easily accessible, systematic and ecological data for species of known or potential importance to the military, public health organizations and other scientific and environmental agencies; (2) enhances current and future laboratory and field mosquito research efforts; (3) provides knowledge of deficiencies in the National Mosquito Collection and allows new collection strategies; (4) alleviates managerial problems by providing a timely and cost-efficient collection inventory; and (5) serves as a model for the storage/analysis of mosquito biological data on a world-wide level.

The project is located at the Smithsonian Institution and works in close association with: (1) Walter Reed Biosystematics Unit, from the Walter Reed Army Institute of Research; (2) the Systematics of *Aedes* Mosquitoes Project; (3) Department of Entomology, Smithsonian Institution; and (4) Systematic Entomology Laboratory, U. S. Department of Agriculture. It was designed to be responsive to the needs of these organizations, as well as other governmental or institutional scientific organizations.

REVIEW OF PROGRESS FOR THE PERIOD
1 JULY 1982 TO 30 AUGUST 1983

I. Personnel and Equipment

A. The addition of a technician during this year had major impact on the project. Ms. Dolores Cantu (IS-5) began working in mid-July 1982 and was trained in general project procedures, data entry, map making and the use of the SI Calcomp Plotter. This last piece of equipment prepares the computer-digitized maps from the World Data Bank II computer program. These maps are one of the major services provided by MIMP. Ms. Cantu's training and proficiency gives MIMP more flexibility and reduces the request load to the Smithsonian Office of Information Resource Management.

B. During this period the computer program, World Data Bank II (previously obtained from the National Technical Information Service) was incorporated into the Smithsonian's Honeywell® computer by the Office of Information Resource Management (formerly Office of Computer Services). This program allows the production of computer-digitized maps for plotting distribution maps based on the specimens in the collection. Over 26 (through 25 Aug) computer generated maps were produced to fulfill outside requests.

C. The NBI® 3000 Word Processor in the Walter Reed Biosystematics Unit was tailored to the DEK Word Processor in the Automatic Data Processing (ADP) Office in the Smithsonian Institution, and to the NBI® 3000 Word Processor in the Department of Arbovirology, USAMRIID, Fort Detrick, Frederick, Maryland. These link-ups enable MIMP to communicate information requested by colleagues within hours of the request.

D. The software for the NBI® 3000 Word Processing System was upgraded from Level C to Level G to increase word processing capabilities. New capabilities include abilities to search for footnotes, insert documents and delete phrases.

E. Over 1100 maps were received and filed, expanding the map collection to over 11,300 maps.

II. Data Input

A. Data from 4,543 collection forms were entered into the SELGEM master file during this period, representing approximately 116,698 specimens. The majority of forms used originated from the John N.

Belkin Central American collections. Data from all of the Belkin Central American collections, including those from Mexico, have been entered into the computer (see Figure A). Emphasis has shifted to the extensive collections from South America and the Caribbean regions. Data entry has already been completed for all available collections from Venezuela, Colombia and Suriname.

In addition to western hemisphere collections, data from 44 collection forms from Kenya representing 511 specimens, were entered into the computer data base for Eastern Africa.

With the above entries, data from a total of 10,322 collection forms and 317,904 individual specimens have been entered into the master files.

B. Seven separate geographic master files have been established to simplify and speed up the efficiency of queries. The use of such files quickly reduces the search effort for specific queries, and will greatly reduce computer charges as the data base expands. The 7 files established to date are:

1. Mexico and Central America-includes Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, and Panama.
2. Western South America-includes Chile, Colombia, Ecuador, Peru, and Venezuela.
3. Northeastern South America-includes Brazil, French Guiana, Guyana, and Suriname.
4. Southeastern South America-includes Argentina, Bolivia, Paraguay, and Uruguay.
5. Greater Antilles-includes Bahama Islands, Cayman Islands, Cuba, Dominican Republic, Haiti, Jamaica, Puerto Rico, and Virgin Islands.
6. Lesser Antilles-includes Anguilla, Antigua, Barbados, Barbuda, Dominica, Grenada, Guadeloupe, Martinique, Montserrat, Nevis, St. Kitts, St. Lucia, St. Martin, St. Vincent, and Trinidad and Tobago.
7. Eastern Africa-includes Burundi, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Southern Rhodesia, Uganda, United Republic of Tanzania and Zambia.

III. Queries and/or Requests

During the year, the MIMP staff received and answered over 150 requests for information from computer files, data entry into computer files, computer/word processor communications, and information from data standards and map and gazetteer collections. An additional 26 requests were for computer digitized

maps from Word Data Bank II. Many of these were modified by hand, adding place names, titles, captions, inking boundaries and mounting on heavy backing for photography. These requests include:

1. All mosquito collection records available for Kenya, French Guiana and Honduras.
2. Specific mosquito collection records from Mexico and Guyana made by specific collectors.
3. All collection records including the species *Trichoprosopon* for Dr. Thomas J. Zavortink (WRBU).
4. Data entry for various collections to include:
   a. Collections made by Donald J. Pletsch in Guyana.
   b. Collections with *Trichoprosopon*, *Shannoniana* and *Runchomyia* for Dr. Thomas J. Zavortink.
   c. Collections in Kenya for LTC Charles L. Bailey (USAMRIID) and CPT Kenneth J. Linthicum (USAMRU-KENYA).
5. Update of new species names from new taxonomic revision of *Trichoprosopon*.
6. Computer-generated maps of S. Europe and N. Africa, Kenya, Thailand, Brunei, and the Tres Bracos Area of Brazil.
7. Computer-generated maps of Africa, Egypt and Israel, modified and printed for general use by mosquito specialists in WRBU for plotting distributions of mosquitoes.
8. Digitized maps of Costa Rica, and Mexico and Central America, with distribution points of all available collections.
9. Digitized map of Bolivia, modified for WRBU publication by Mr. E. L. Peyton.
10. Digitized map of Central America and South America including all collection points for *Tr. (Trc.) digitatum* for LTC Donald R. Roberts (WRAIR) and Dr. Thomas J. Zavortink (WRBU).
11. Set of digitized maps, one for each country of Central America, to be used in the production of DVEPS by the Defense Pest Management Analysis Center, Armed Forces Pest Management Board. Each map included distribution points for collections of two medically important species, *An. (Nys.) albimanus* and *An. (Ano.) pseudopunctipennis*.
12. List of any *Culex* species found in cocoa plants in Costa Rica for Dr. Ronald A. Ward (WRAIR).
13. List of any *Aedes* species (especially *aegypti*) from *Heliconia* in the Greater and Lesser Antilles (especially the Island of Saba) for Dr. Ronald A. Ward.
14. General information about the project and collection forms were given to dozens of requestors.
15. Information about specific individual rearings were fulfilled for at least 5 requestors.
16. List of all mosquito species found in the Guianas for MAJ Edward

S. Saugsted (AFMIC).
17. Digitized map of Canada requested by Dr. G.A. Bedard (NCMEP).

Requestors were from a variety of agencies including DPMIAC, AFPMB, AFMIC, WRBU, MEP, and U.S. Navy. Approximately 40% of the project's time is spent on requests from these groups.

IV. Other Activities

A. Separate meetings were held with Dr. Lewis T. Nielsen, editor of *Mosquito Systematics*, and CDR Fred Santana, of the Defense Pest Management Analysis Center, Armed Forces Pest Management Board. These meetings were intended to stimulate an exchange of information and provide a basis for future collaborative efforts.

B. Personnel in MIMP, or affiliated with the project, attended several scientific or computer meetings during this period: (1) Annual Meeting of the American Mosquito Control Association (AMCA), Florida; (2) Federal Computer Conference, Washington, DC; (3) bimonthly meetings of the Smithsonian Small Computer Group, SI; and (4) visit to London School of Tropical Medicine and Hygiene, London, England (at no cost to the contract). Considerable interest in MIMP was generated by distributing information packets at the annual AMCA meeting in Florida. This activity resulted in requests for additional information and a number of visitors to the project. In addition, the project manager learned about the kinds of information useful to different types of mosquito projects.

C. A paper entitled "Computerized Information and Collection Management System for Systematic Research and Medical Entomology (Diptera: Culicidae)" and authored by MIMP, USAMRIID and Office of Information Resources Management personnel is currently in press. This paper will be published in the Journal of Medical Entomology, and should bring the project to the attention of medical researchers who would benefit from this valuable data base.

D. During this period a test was performed to determine an approximate time it takes to enter data from a typical collection form. The example used was MEX 522 (see Figure B). To get these data through 5 stages took 27 minutes. The stages are as follows:

1. Data Preparation
   (including confirmation of latitude/longitude)
2. Data entry into computer terminal from two sources:
   a. collection form
   b. published information (if any)

3. Examination of data for errors
4. Correction of errors
5. Confirmation of corrections

E. During the year MIMP received 37 visitors from the following organizations:

1) Defense Pest Management Information Analysis Center (DPMIAC), Armed Forces Pest Management Board, Washington, DC; 2) Center for Disease Control (CDC), Atlanta, GA; 3) U.S. Army Medical Research Institute for Infectious Diseases (USAMRIID), Ft. Detrick, Frederick, MD; 4) Armed Forces Medical Intelligence Center (AFMIC), Ft. Detrick, Frederick, MD; 5) Systematic Entomology Laboratory (SEL), IIBIII, USDA, Beltsville, MD; 6) Insects Affecting Man and Animals Research Laboratory, USDA, SEA-AR, Gainesville, FL; 7) USAF, OEHL/ECQ, Brooks AFB, TX; 8) Nucleo de Medicina Tropical e Nutricao, Universidad de Brazilia, Brazil; 9) USAMRU-Kenya; 10) London School of Hygiene and Tropical Medicine, London, England; 11) Nepal Malaria Eradication Organization, Kathmandu, Nepal; 12) FDA, Washington, DC; 13) Institute of Arctic Biology, University of Alaska, Fairbanks, AK; 14) Ain Shams University, Cairo, Egypt; 15) U.S. Army Medical Component, AFRIMS, Thailand; 16) Royal Army Medical College, London, England; 17) Directors Office, NMNH, SI, Washington, DC; 18) Center for Biological Control of Mosquitoes, Ben-Gurion University of the Negev, Beer-Sheva, Israel; 19) National Institutes of Health, NIA, GRL, Baltimore, MD; 20) Center for Public Health Research, SC; and 21) University of Alexandria, Egypt.

FIGURE A

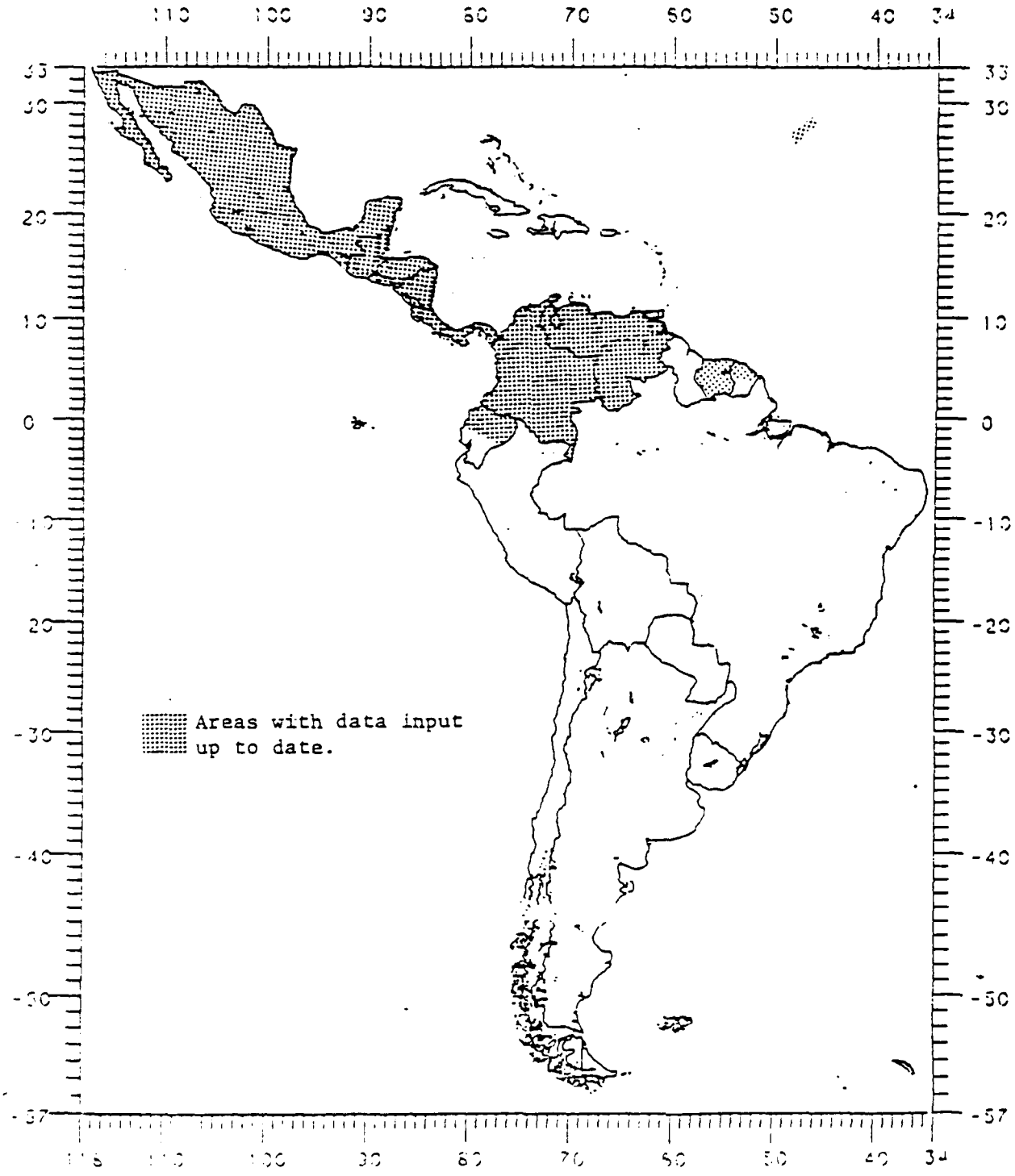
110
100
90
80
70
60
50
40
30
30
20
10
0
-10
-20
-30
-40
-50
-57
Areas with data input
up to date.

FIGURE 5

✓

* [actual elevation prob. less]

MOSQUITOES OF MIDDLE AMERICA

Code: Mex 32.3km state Rt. 175

Number: 522

Locality: 20.2 miles north on Hwy 175 from Ixtlan de Juarez, Oaxaca

Nearest town: ______

District: ______

Province: Oaxaca

Country: Mex

Date: July 4 1970

Collector: K & D. Schroeder

Elevation: ~~[illegible]~~ * 2300m

(Photo) yes [slides on file at UCLA]

GENERAL ENVIRONMENT -1. Woody plants: height 0 - 2 - 8 -(15 - 30m); density 0 - 1 -(2 - 3) 2. Herbs, grasses: height 0 -(.5 - 1)- 2 - 5 - 8m; density 0 -(1 - 2)- 3 3. Epiphytes: 0-(1)- 2 - 3 (4. Edge) or interior of vegetation (along road) dike, bank 5. Shore of sea, lake, stream mangrove, saltmarsh 6. Virgin vegetation (clearing) grazing, plantation, cultivation, domestic 7. Light: deep shade (partial shade ~~[illegible]~~)

Annual rainfall: ca ______ cm Rainy season: J - F - M - A - M - J - J - A - S - O - N - D Vegetation type: [illegible]

IMMATURE STAGES

Breeding site -1. Pond, lake 2. Ground pool: (large) small 3. Animal tracks 4. Swamp interior, margin, marshy depression 5. Flooded forest 6. Seepage, spring 7. Well 8. Stream: margin, (pool), blocked (9. Ditch), drain 10. Fountain, gutter 11. Crabhole: large, small 12. Rockhole: volcanic, coral stream margin, seaside 13. Artificial container: large, small: ______ 14. Treehole: large, small: ______ 15. Fallen tree: ______ 16. Bamboo: cut or broken, uncut internode 17. Animal container on ground: ______ 18. Fallen leaf, frond, spathe: ______ 19. Fallen fruit, nut, rind: ______ 20. Attached fruit: ______ 21. Leaf axil: epiphytic, terrestrial: ______ 22. Flower: bract, spathe: ______ 23. Pitcher: ______ 24. Trap: bamboo pot, ______ Height of site above ground ______ m

Water - 1. Permanent, semipermanent, temporary (2. Clear) turbid, colored: slightly muddy 3. Stagnant (slow) moderate, strong current (4. Fresh), brackish, salty 5. Foul, slimy, fermenting

Vegetation in Breeding Site - (1. Abundant) scanty, none 2. Flotage, scum, algae (3. Grassy) herbaceous, woody, floating: ______, submerged: ______

Bottom - (1. Mud) sand, gravel, rock 2. Organic matter: (plant) ______ animal ______

SUBLOTS

	Species	L	l	P	p	M	F	E
-1	Culis. [illegible]	14	2	2				
-2	C. arizonensis	6		20	8	2	10	
-3	An.	1*						
-4								
-5								
-6								
-7								
-8								
-9								

REMARKS

The Culex [illegible] at the bottom of the containers with [illegible].

* An early instar

ADULTS

1. Site: (specify exact situation) ______
2. Type: biting-landing, swarming, resting, sweeping, at light ______, trap: ______
3. Height above ground ______ m
4. Host or bait: ______
5. Time of capture: ______

No 522 ✓ present 0 lost INDIVIDUAL REARINGS + dead, preserved in alcohol

Sub	Species	l	p	M	F	Sub	Species	l	p	M	F	Sub	Species	l	p	M	F	Sub	Species	l	p	M	F
-100	arizonensis		✓	✓	✓	-21	arizonen.	✓	+			-47						-73					
-101	"		✓		✓	-22						-48						-74					
-102	"		✓		✓	-23						-49						-75					
-103						-24						✓-50	chucesi	✓	+			-76					
-104						-25						-51						-77					
-105						-26						-52						-78					
-106						-27						-53						-79					
-107						-28						-54						-80					
-108						-29						-55						-81					
-109						~~-30~~	Im.					-56						-82					
-110						-31						-57						-83					
-111						-32						-58						-84					
-112						-33						-59						-85					
-113						-34						-60						-86					
-114						-35						-61						-87					
-10	chucesi	✓	✓	+		-36						-62						-88					
-11	"	✓	✓	✓	✓	-37						-63						-89					
-12	"	✓	✓	+		-38						-64						-90					
-13	"	✓	✓		✓	-39						-65						-91					
-14	"	✓	+			~~-40~~	~~[illegible]~~					-66						-92					
-15	"	✓	+			-41						-67						-93					
-16	"	✓	+		+	-42						-68						-94					
-17	"		+			-43						-69						-95					
-18	"	✓	+			-44						-70						-96					
-19	"	✓	+			-45						-71						-97					
-20	arizonensis	✓	✓	✓		-46						-72						-98					

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